

clouds, dew, and frost, prediction of frost, and the protection from frost.

The cause, formation, and forward movement of the cyclonic and anticyclonic areas, and of local thunder and hail storms, and of the more severe tornadoes, as they appear on the daily weather maps, will be carefully studied in this part of the course. Attention will then be turned to the causes and distribution of rainfall. The relations between rainfall and agriculture, rainfall and forests, migration of rain belts, and the effect of clouds and rainfall on the general circulation of the atmosphere will be touched upon. The study of the weather and climate, particularly of the United States, will close the course.

Dr. Isaac M. Cline, M. A., M. D., Ph. D., Local Forecast Official and Section Director in the Weather Bureau, is lecturer on climatology in the University of Texas. The course in medical climatology was delivered by him during the winter of 1898-99 weekly to the fourth year students.

The course embraced briefly a description of instruments and methods used in determining climatic conditions and changes; the origin of the atmosphere, its evolution, composition, and offices together with its extent and spherical arrangement; the control of atmospheric temperatures, radiation, insolation, absorption, transmission, conduction and reflection, with particular reference to the manner in which local conditions influence these in making differences in climate; the distribution of temperatures over land and water; the pressure and general wind movements and the ways in which they influence general and local climate; the moisture of the atmosphere, absolute and relative humidity, and sensible temperature of the atmosphere; clouds and sunshine and their distribution; the causes of distribution of precipitation; weather and the control of weather changes, with generalizations as to weather forecasting. Then was taken up the manner in which weather changes and different conditions of climate influence the physiological functions of different organs of the body; the divisions of climates based upon these effects into "low, damp, warm climate," "low, damp, cold climate," "high, dry, climate," and intermediate grades; the mineral springs; topographic features and distribution of climate in the United States; the relation of climate to pathology and its influence in the distribution of the more important classes of diseases. Charts and diagrams were used where practicable to illustrate the more important features of the lectures.

Dr. O. L. Fassig, Ph. D., (Johns Hopkins University, 1899), has been instructor in climatology in the department of geology since 1896. His course during the year 1897-98 was twice weekly for two months:

In this course of lectures the topics chiefly considered were: Heat and its distribution over the earth's surface; rainfall and evaporation, their distribution and effects; winds and storms; weather sequences as illustrated by the daily weather charts of the United States Weather Bureau; extent to which topography influences the distribution of the climatic elements; variability of climates; organization and methods in statistical meteorology.

There was also two weeks of field work by the students in a meteorological camp occupied by them in the spring of 1898 in western Maryland.

During the year 1898-99 the following lectures were given, being intended especially for students in geology, medicine, and physics: I. The scope and aim of climatology; the earth's atmosphere; climatic factors. II. Solar radiation. III. The distribution of temperature at the earth's surface. IV. The distribution of atmospheric pressure and the resulting movements of the atmosphere. V. Storms. VI. The moisture of the atmosphere; its visible forms as cloud, rain, snow, dew, fog, etc. VII. Rainfall and its distribution at the earth's surface. VIII. Climates with special reference to the climate of the United States. IX. The daily weather chart. X. Forecasting the weather. XI. The movements of ocean waters and their influence upon climates. XII. Variations in climate, periodic and secular.

During the coming college year, 1899-1900, Dr. Fassig's

course will embrace twenty or more lectures on the various aspects of climatology.

The fact that Harvard University accepts an examination in elementary meteorology with original note books of observations and laboratory work as one of the items for admission to Harvard College and the Lawrence Scientific School and as preparatory to higher work in meteorology within the University itself, must greatly stimulate high schools and academies to introduce this subject in their own course of study. An admirable pamphlet of sixteen pages has been published by that University, giving in detail the elementary course of instruction that should be pursued at such academies and further information may be obtained from Mr. R. deC. Ward, Cambridge, Mass.

At some future time the Editor hopes to summarize the instruction given in meteorology by those who are *not* officials of the Weather Bureau.

THE WEATHER AND THE DAIRY.

In the August report of the Virginia Section Mr. E. A. Evans collects together what little is known with reference to the relation of cold weather to the quantity and quality of the milk given by cows. It appears that in general there is a decided diminution in the cream as soon as the weather turns cold, thus justifying the practice of dairymen in keeping the barns artificially heated during cold weather. An interesting case is quoted by Mr. Evans from his own experience in northern Minnesota, in which, although the barn was not artificially heated, yet the cow gave an abundance of rich milk because the ration that was fed to her every evening was hot instead of cold; otherwise the quality and quantity were the same as those given to other cattle.

BALL LIGHTNING.

In the August report of the Utah Section Mr. L. H. Murdoch publishes an account of lightning phenomena that occurred in Salt Lake City in the yard of Senator J. L. Rawlins on August 4. This ball is said to have first appeared to be about a foot in diameter, of a ruby red color, entering an open window on the north side of the house. It passed across the hall into the sitting room and out of an open south window, bending and twisting the shrubbery in front of the latter. It then passed southward, tearing up some sod in the yard, and struck a poplar tree about 50 feet distant. The south side of the tree was torn and shattered.

In the usual typical cases of ball lightning very little destruction is reported. The whole phenomenon seems to be confined to the atmosphere and the luminous ball rolls along very slowly. In the present case the tearing up of the sod in the yard and the injury to the poplar tree suggests that after all this may have been only an ordinary discharge of lightning. The doubt would be entirely removed if the observer had stated how many seconds were occupied by the ball in passing from the north side of the house through the latter to the poplar tree.

In the August report of the Maryland and Delaware Section Mr. F. J. Walz publishes a case of ball lightning described by Dr. Stokes, but there is no clear evidence that this differed essentially from an ordinary discharge of lightning.

In former times English writers frequently spoke of a bolt of lightning, or a lightning bolt. This is a figurative expression rather than a descriptive one, and apparently refers to the suddenness of the occurrence. Possibly our observers